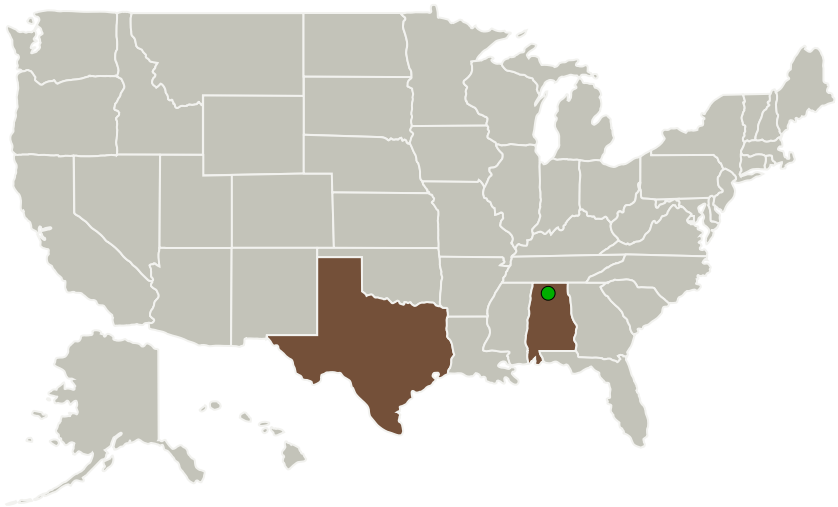
# Handheld FRET-Aptamer Sensor for Water Safety, Phase I

Completed Technology Project (2010 - 2010)

## Project Introduction

Operational Technologies Corporation (OpTech) proposes to expand its current NASA Phase 2 SBIR handheld fluorometer and bone marker fluorescence resonance energy transfer (FRET)-DNA aptamer assay system to include detection of bacteria, fungi, and parasites that may contaminate astronauts' water supplies. For Gram positive bacteria, teichoic acids and peptidoglycan will serve as targets. For Gram negative bacteria, common lipopolysaccharide moieties such as 2-keto-3-deoxyoctanate (KDO antigen) will be targeted for aptamer development. Similarly, for fungi, cell wall chitin will be used to select highly specific FRET-aptamers from a randomized DNA library. Parasites such as Cryptosporidium and Giardia will require more specific whole cell or surface protein aptamer selection approaches, but OpTech has recently demonstrated detection of 30 E. coli bacteria per ml using such an approach under NSF Phase 1 SBIR funding. Prototype assays will be lyophilized in plastic cuvettes and capped under vacuum or otherwise sealed to prevent opening in negative pressure environments. Lyophilization with trehalose or other excipients will extend shelf-life to greater than 2 years for these rapid (15 minute) one step (homogeneous) FRET assays that will be quantified with an ultrasensitive commercial handheld fluorometer. Data can be displayed on the handheld reader and downloaded to a laptop computer.

## Primary U.S. Work Locations and Key Partners

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## Table of Contents

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| Organizations Performing Work | Role | Type | Location |
|---|---|---|---|
| Operational Technologies Corporation | Lead Organization | Industry<br>Minority-Owned Business, Small Disadvantaged Business (SDB), Veteran-Owned Small Business (VOSB) | San Antonio, Texas |
| Marshall Space Flight Center(MSFC) | Supporting Organization | NASA Center | Huntsville, Alabama |

| Primary U.S. Work Locations | |
|---|---|
| Alabama | Texas |

## Project Transitions

**January 2010:** Project Start

**July 2010:** Closed out

**Closeout Documentation:**

- Final Summary Chart*(https://techport.nasa.gov/file/139038)*

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Organization:**

Operational Technologies Corporation

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

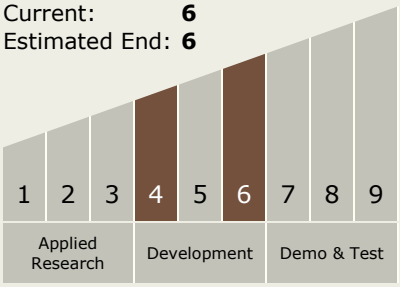
Carlos Torrez

**Principal Investigator:**

John Bruno

## Technology Maturity (TRL)

Start: **4**
Current: **6**
Estimated End: **6**



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## Technology Areas

**Primary:**

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.4 Environmental Monitoring, Safety, and Emergency Response
    - TX06.4.1 Sensors: Air, Water, Microbial, and Acoustic

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System